CARBON STOCK IN A SANDY SOIL OF THE SOUTHWESTERN AMAZONIA

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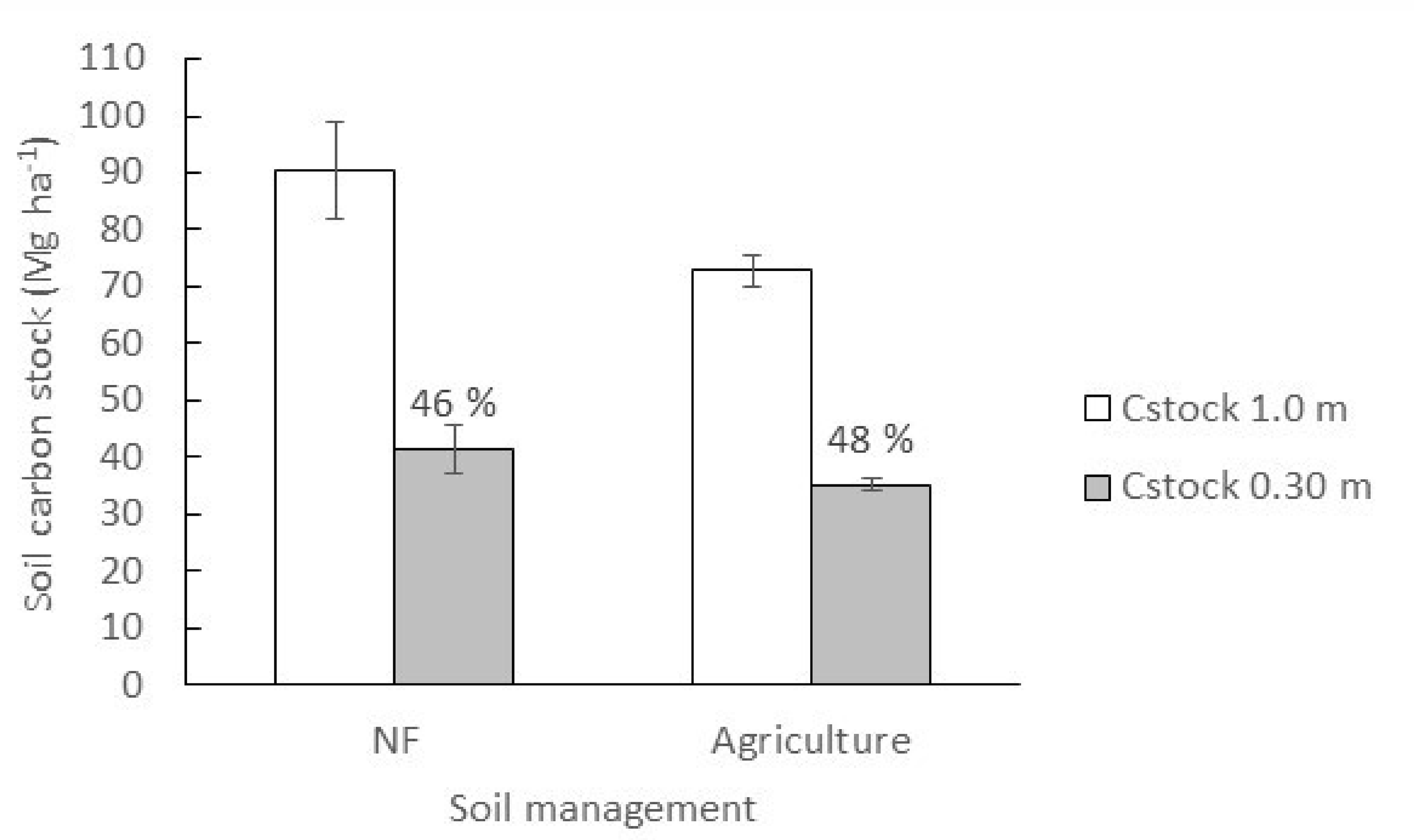
INTRODUCTION

Soil conservation management (SCM) system with no-till (NT), cover crops and cash crops in rotation and/or succession, limestone and fertilizers can recover and/or maintain soil quality in terms of its carbon (C) stock in comparison to the slash-burn system with or without conventional tillage (CT). The objective of this study was to determine the effect of SCM system on temporal variation of soil carbon stocks in its natural state (native forest – NF) and under different tillage/cropping systems.

METHODS

The experiment was conducted in a sandy Acrisol of the smallholder property, Mâncio Lima municipality, Acre state, Brazil, in split-plot design in a randomized complete block design with three repetitions, for NT and CT (main parcels), and the succession manioc (*Manihot esculenta*)/cover crops (green manure)/maize (*Zea mays*). The sub parcels were: (1) control: slash and burn (C); (2) cover crops (*Mucuna aterrima* or *Canavalia ensiformes* or *Sorghum bicolor*) among cash crops (CC); (3) CC with addition of P-fertilizer (CCP); (4) CC with addition of limestone (CCL); and (5) CC with addition of P-fertilizer and limestone (CCPL). Disturbed and undisturbed soil samples were collected (0-1.0 m) in the Amazonian summer of 2006 (beginning of the experiment), 2012, 2016, and analyzed for total organic carbon (Walkley-Black), and physical and chemical properties. C stocks were calculated in mass basis. In this study are presented only soil C stocks in NF, C and CCPL both under CT and NT. The C stock is presented for the layer 0-0.30 m because approximately 50 % of the total C stock are located in this layer (Fig. 1).

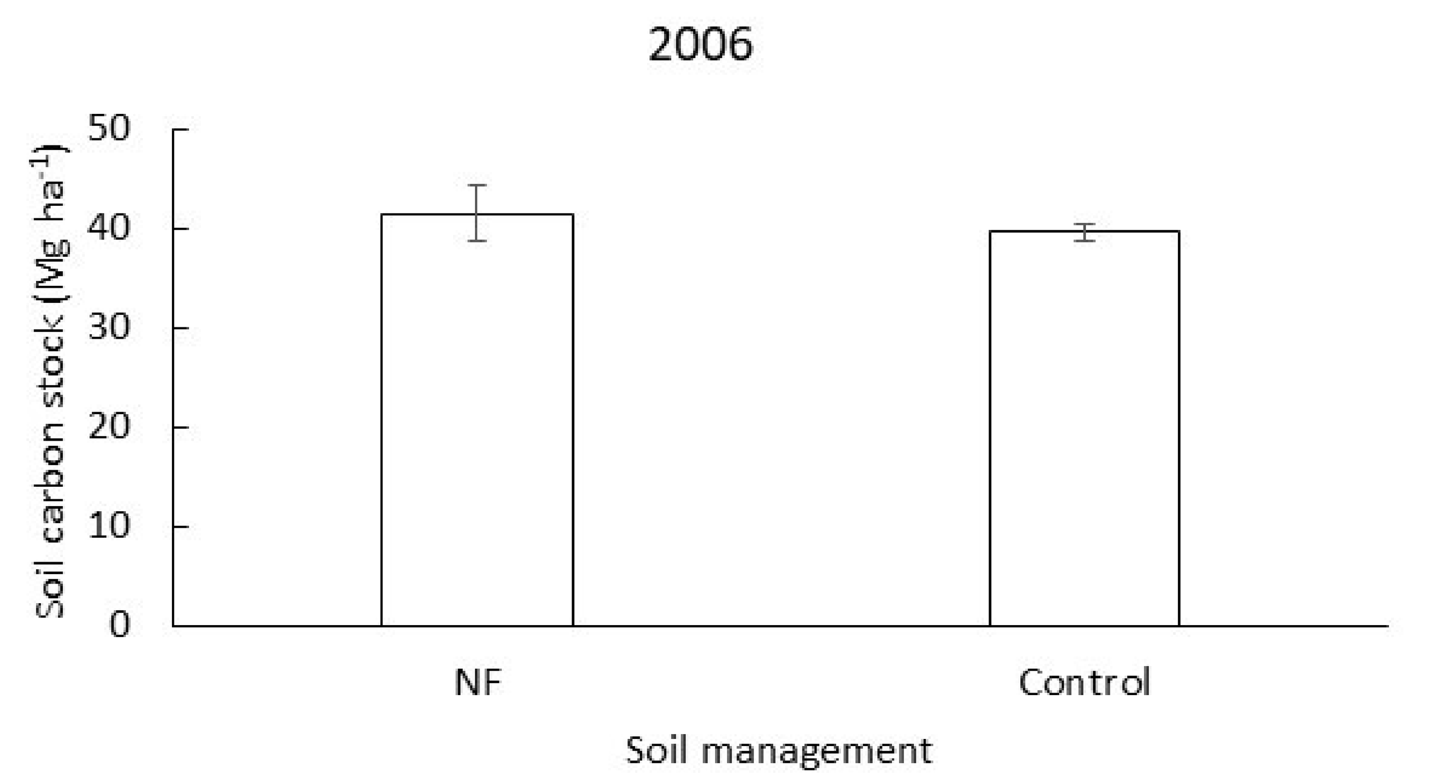
Fig. 1. Soil carbon stock in the layers of 0-1.0 m (Cstock 1.0 m) and 0-0.30 m (Cstock 0.30 m) under native forest (NF) and agriculture.



RESULTS AND DISCUSSION

The greatest C stock was in NF (41.5±2.9 Mg ha^{-1}) that ranged from 16.1±0.7 Mg ha^{-1} (0-0.10 m) to 12±1.1 Mg ha^{-1} (0.20-0.30 m). In the beginning of the experiment in 2006 after 17 years of deforestation (1990) and soil slash-burn use the C stock decreased to 39.7±0.8, a reduction of the 4.5 % (Fig. 2). There was no statistical difference among soil management systems in all years investigated.

Fig. 2. Soil carbon stock (0-0.30 m) under native forest (NF) and control in the beginning of the experiment (2006).



The others land use reduced an average of 15 % of the C stock (0-0.30 m) under NF (Fig. 3 - 2012 and 2016). Over time all soil management systems reduced the soil C stock. However there is a tendency between 2012 and 2016 to recuperation of the soil C stocks. Exception is the CT-C that continues losing carbon (Fig. 4).

Fig. 3. Soil carbon stock (0-0.30 m) under native forest (NF), conventional tillage (CT), no tillage (NT), control (C) and cover crops with addition of P-fertilizer and limestone (CCPL) in 2012 and 2016.

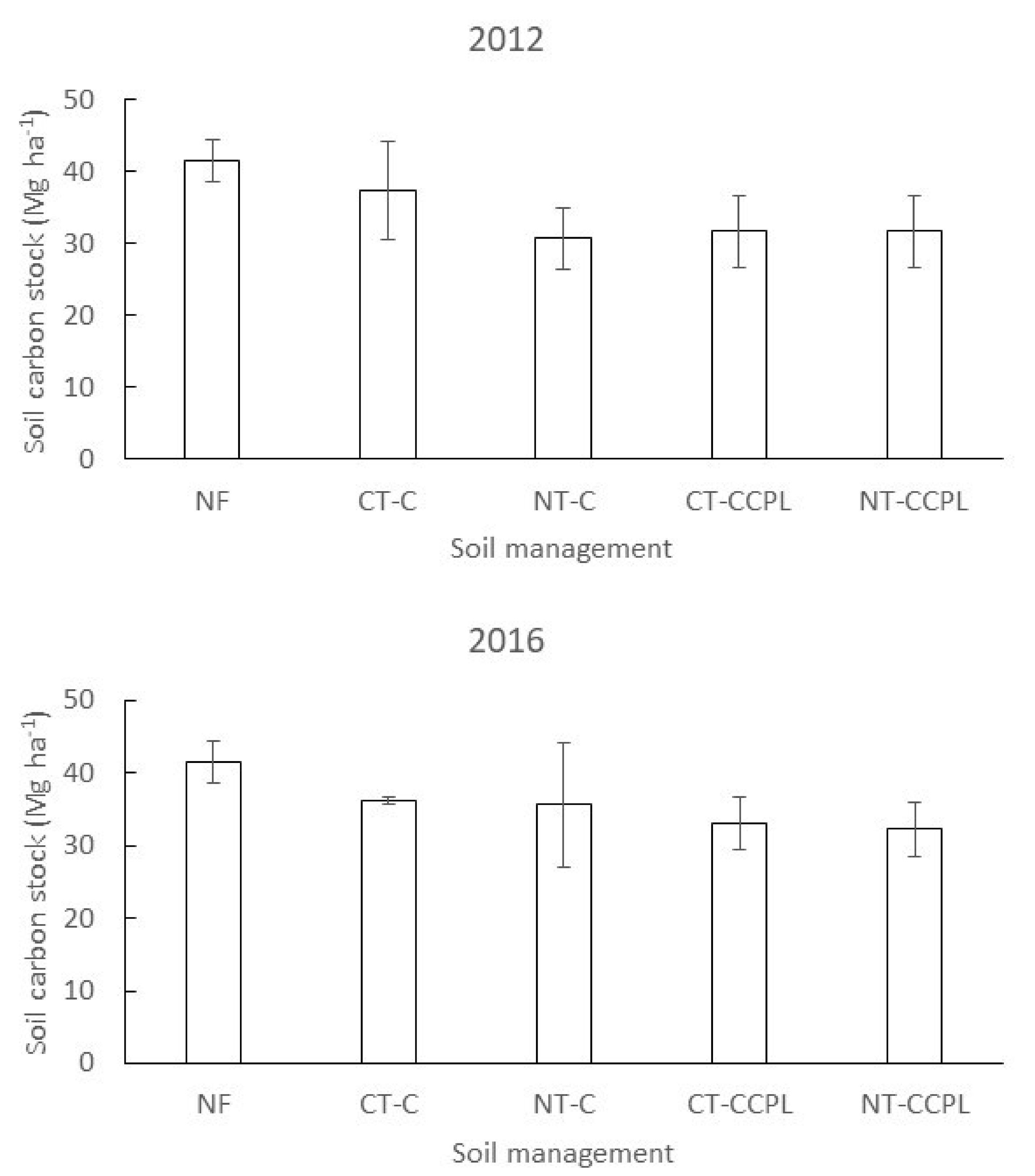


Fig. 4. Soil carbon stock (0-0.30 m) over time under conventional tillage (CT), no tillage (NT), control (C) and cover crops with addition of P-fertilizer and limestone (CCPL).